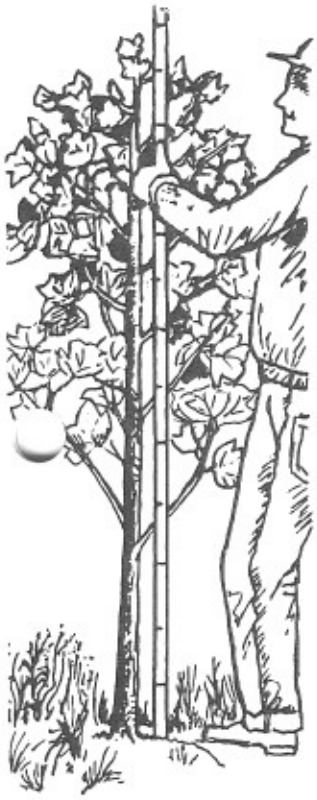

OCCASIONAL REPORT 99 AUGUST 1991

LOBLOLLY PINE RELEASE STUDY

REPORT NUMBER

24

Virginia
Department of Forestry

LOBLOLLY PINE RELEASE
Report #24

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ABSTRACT

This study included two treatments: no release and aerial application of 2 pounds active ingredient of 2,4,5-T per acre during the third growing season. Hardwood competition was light. At age 20, released plots averaged 11 percent more basal area and 18 percent more volume in standard cords than check plots. Cordwood yields were related to both hardwood basal area measured at age 20 (r^2 = .611) and a free-to-grow index estimated at age 4 (r^2 = .319).

INTRODUCTION

This is the twenty-fourth in a series of Occasional Reports concerning the release of loblolly pine seedlings from hardwood competition. This study was installed in Stand 19 of the Jamison 6 Management Unit on the Appomattox-Buckingham State Forest, which is located in the central Piedmont of Virginia. The previous stand was mixed hardwood, mostly oak. Following harvest, the site was drum-chopped and burned in the summer of 1969. It was planted in the spring of 1970. Most of the tract was released in the summer of 1972, during the third growing season, by aerial spraying using 2 pounds active ingredient of 2,4,5-T per acre in a total volume of 5 gallons per acre. A swath was left untreated as a control (Figure 1).

GROWTH PLOT INSTALLATION

Permanent 1/10-acre growth plots were installed in January of 1974, at age 4. Ten plots were installed, five each in the released and unreleased portions of the tract (Figure 1). Volunteer Virginia pine and shortleaf pine seedlings were pulled up or cut down when the plots were installed. The tract was machine planted, with the rows running perpendicular to the direction in which the plots were laid out (see Figure 1). Row spacing was fairly uniform in plots 1, 2, and 3, but was wider and more variable in plots 4 and 5, particularly in plot 4. This resulted in a considerable range in stocking among plot pairs, but also unusual uniformity in stocking within plot pairs. Hardwood competition was light and would hardly justify a release operation.

Measurements were made at age 4, when the plots were installed, and again at ages 8, 12, 16, and 20. At age 4, all loblolly pine seedlings were measured for height to the nearest foot, and classified as to free-to-grow status using a four-part classification system.[1] At later measurements,

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[1] See Occasional Report No. 78 (Release Report No. 11) for a description and discussion of this classification system.

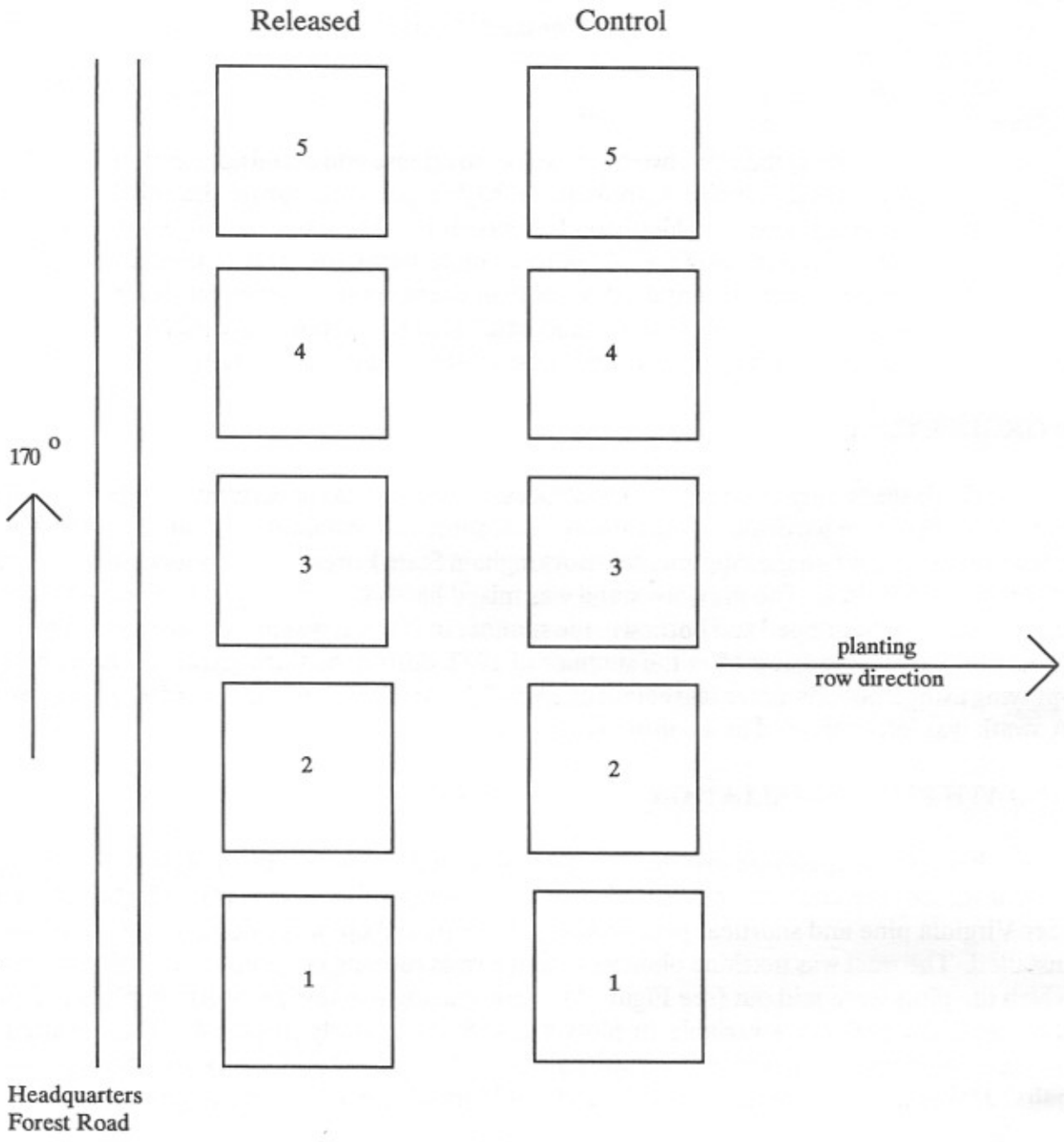

Figure 1. Layout of growth plots.

diameter at breast height of each loblolly pine was measured to the nearest inch, and a sample of trees in each diameter class was measured for total height to the nearest foot, noting which trees were dominant or codominant. For the final measurement at age 20, all hardwoods over .5 inch DBH were tallied by species, 1-inch diameter class, and crown class. Total height to the nearest foot was measured on all intermediate, codominant, and dominant hardwoods.

RESULTS AND DISCUSSION

A summary of loblolly pine data for the five measurements is presented in Table 1. At age 20, released plots averaged 3.7 standard cords per acre more than check plots.[2] Differences due to release increased with time (Table 2). Table 3 presents stand tables for loblolly pine at age 20.

Average loblolly pine stocking at age 4 was very similar for the check and released plots, but there was considerable variation among plots, ranging from 210 to 540 seedlings per acre. Pulpwood yields at age 20 were strongly related to numbers of loblolly pine seedlings initially present (Figure 2). The linear regression lines in Figure 2 were fitted separately to the check and released plots, and have almost identical slopes (.0299 and .0300 for check and released plots, respectively).

A summary of average hardwood data at the final measurement at age 20 is presented in Tables 4 and 5, and individual plot data is presented in Table 6. Check plots had over 3 times as many hardwoods and 3 times the hardwood basal areas as released plots.

There were one codominant and three dominant hardwoods on the five check plots (8 per acre), and two codominant and no dominant hardwoods on the five released plots (4 per acre). Three of these six trees were scarlet oak and three were yellow-poplar. Their heights ranged from 42 to 47 feet and averaged 46 feet on the check plots and 44 feet on the released plots. Some of these trees, more likely the scarlet oaks, may continue to grow rapidly enough to maintain a position in the crown canopy.

Cordwood yields of loblolly pine at age 20 were related to the amount of hardwood present. Figure 3 shows pine cordwood yields related to hardwood basal area at age 20 for the 10 plots. The simple linear regression fitted to these data accounted for 61 percent of the variation in cordwood yields.[3] Cordwood yields were also related to the average free-to-grow class for each plot,

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[2] Standard cords at age 20 were subjected to an analysis of variance for randomized blocks (caution should be used in interpreting the results of this analysis, because treatments could not be truly randomized). Yields on released plots were significantly greater than on check plots (probability of a larger F = .009).

[3] Estimated standard cords = 26.48 - .4958 (hardwood basal area), r^2 = .611, probability of a larger F = .0076.

Table 1. A summary of loblolly data at ages 4, 8, 12, 16, and 20: number of trees per acre, average DBH, basal area per acre, standard cords per acre, and average height of dominant and codominant trees.*

	Check Plots						Released Plots					
Age	Plot	No.	DBH	B.A.	Cds.	Ht.	Plot	No.	DBH	B.A.	Cds.	Hts.
4	1	520	-	-	-	7.7	1	490	-	-	-	6.2
	2	520	-	-	-	7.3	2	490	-	-	-	5.7
	3	540	-	-	-	7.5	3	530	-	-	-	6.5
	4	260	-	-	-	7.0	4	210	-	-	-	5.6
	5	320	-	-	-	7.6	5	320	-	-	-	5.5
	Means	432	-	-	-	7.4	Means	408	-	-	-	5.9
8	1	520	3.65	39.6	-	21.9	1	490	3.80	40.1	-	21.8
	2	520	3.55	36.5	-	21.0	2	490	3.69	37.8	-	20.9
	3	540	3.76	43.1	-	21.7	3	530	3.92	45.6	-	22.1
	4	260	3.68	20.0	-	21.5	4	210	3.95	18.5	-	19.2
	5	320	3.78	25.7	-	21.1	5	310	3.65	23.5	-	19.9
	Means	432	3.68	33.0	-	21.4	Means	406	3.80	33.1	-	20.8
12	1	520	5.17	78.6	7.4	32.0	1	490	5.43	81.2	8.0	32.6
	2	520	5.04	74.9	6.1	30.2	2	490	5.53	84.2	8.4	31.2
	3	540	5.19	81.7	7.3	31.9	3	530	5.57	92.4	9.5	32.0
	4	260	4.93	38.5	3.5	30.2	4	210	6.52	49.5	5.1	29.0
	5	320	5.78	59.9	6.1	30.8	5	310	5.84	60.5	5.6	28.7
	Means	432	5.22	66.7	6.1	31.0	Means	406	5.78	73.6	7.3	30.7
16	1	520	5.92	102.8	14.4	39.1	1	490	6.33	110.0	17.5	40.3
	2	520	5.83	100.4	13.6	37.1	2	490	6.33	110.7	16.9	39.7
	3	540	6.00	109.1	15.4	38.4	3	530	6.40	122.6	19.5	39.6
	4	240	6.12	52.6	7.6	38.1	4	210	7.71	69.7	11.1	37.6
	5	320	6.84	84.6	13.4	38.5	5	300	7.13	85.8	13.0	37.4
	Means	428	6.14	89.9	12.9	38.2	Means	404	6.78	99.8	15.6	38.9
20	1	520	6.54	126.1	23.3	44.7	1	470	6.96	128.4	25.8	46.8
	2	520	6.38	121.2	21.2	44.8	2	480	7.02	134.7	26.1	46.4
	3	540	6.50	127.8	23.9	45.6	3	530	6.87	142.5	28.0	46.2
	4	210	7.29	64.1	12.3	46.1	4	210	8.67	87.9	17.6	44.9
	5	320	7.59	103.9	21.0	46.8	5	300	8.07	110.7	22.3	47.5
	Means	422	6.86	108.6	20.3	45.6	Means	398	7.52	120.8	24.0	46.4

*Except at age 4, where heights presented are for all trees.

Table 2. Average differences between check and released plots at each measurement, for basal area and standard cords per acre.

Released minus Check		
Age	Basal Area	Std. Cds.
8	.1	-
12	6.9	1.2
16	9.9	2.7
20	12.2	3.7

Table 3. Average number of loblolly pine per acre by diameter class at age 20.

DBH	Check Plots	Released Plots
2	0	2
3	4	2
4	14	6
5	66	32
6	100	82
7	116	102
8	82	86
9	30	52
10	8	26
11	2	8
Totals	422	398

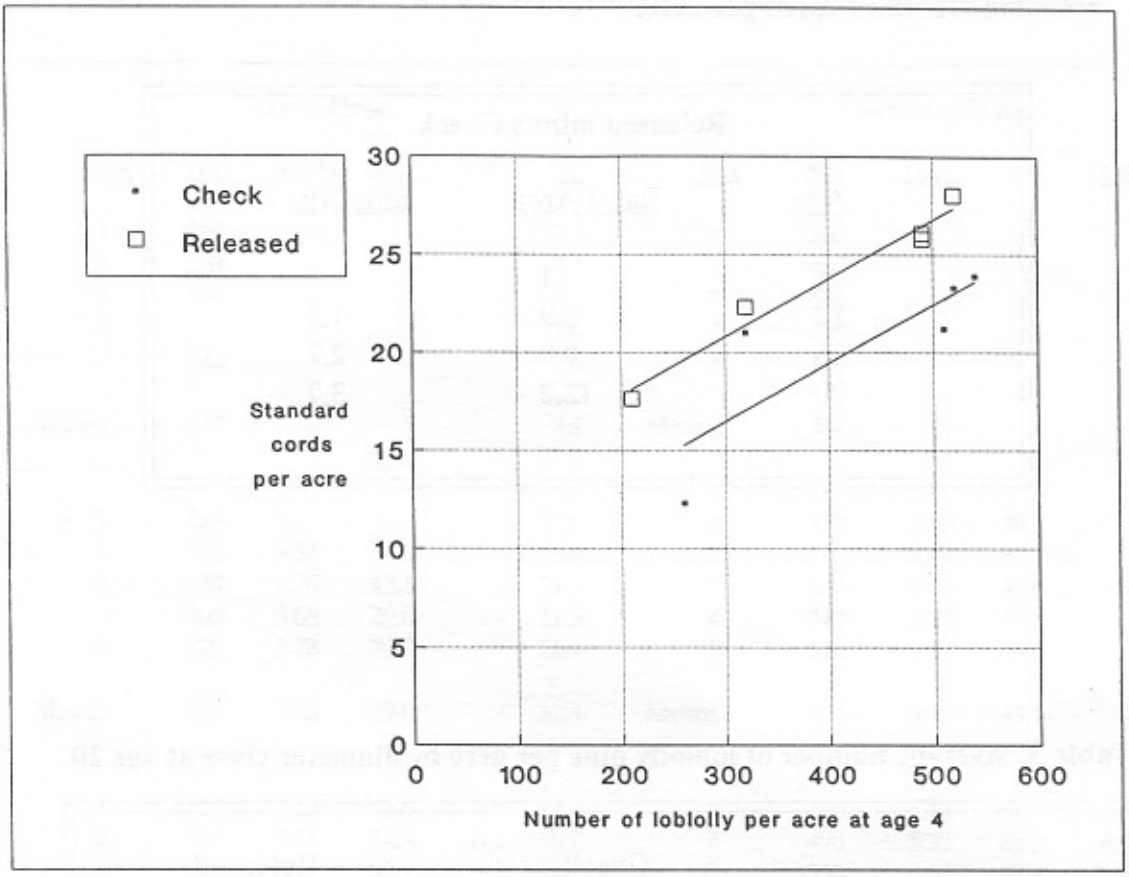

Figure 2. Pine cordwood yields at age 20 related to number of loblolly at age 4.

Table 4. Average numbers of hardwoods per acre by species and diameter class at age 20.

Check Plots
DBH

Species	1	2	3	4	5	6	7	Totals
Chestnut oak	26	20	4	2				52
White oak	78	64	36	2				180
Red oak	142	76	10	6	6	2		242
Red maple	16	2						18
Blackgum	354							354
Hickory	32							32
Yellow-poplar	14	10	4	2	2		2	34
Dogwood	2							2
Chinquapin	4							4
Totals	668	172	54	12	8	2	2	918

Released Plots
DBH

Species	1	2	3	4	5	6	Totals
Chestnut oak	40	20	8	4			72
White oak	42	22	8	2			74
Red oak	42	18	2				62
Red maple	2	6					8
Blackgum	14						14
Hickory	4						4
Yellow-poplar				2		2	4
Dogwood	4						4
Black cherry	2						2
Persimmon	8	4					12
Totals	158	70	18	8		2	256

Table 5. Average numbers of hardwoods per acre by diameter class and crown class, and basal area by crown class, at age 20.

Check Plots

DBH	Over-topped	Intermediate	Codominant	Dominant	Totals
1	668				668
2	172				172
3	52	2			54
4	6	4	2		12
5		6		2	8
6				2	2
7				2	2
Totals	898	12	2	6	918
B.A.	10.47	1.27	.17	1.20	13.11

Released Plots

DBH	Over-topped	Intermediate	Codominant	Dominant	Totals
1	158				158
2	70				70
3	14	4			18
4	2	4	2		8
5					
6			2		2
Totals	244	8	4		256
B.A.	3.25	.55	.57		4.36

Table 6. Numbers of hardwoods by diameter class and crown class, and basal area by crown class, on each 1/10-acre plot.

	DBH	O	I	CD	D	Totals
Check #1	1	64				64
	2	8				8
	3	4				4
	4	1	1			2
	Totals	77	1			78
	B. A.	.81	.09			.89
Check #2	1	79				79
	2	17				17
	3	2				2
	Totals	98				98
	B.A.	.90				.90
Check #3	1	97				97
	2	22				22
	3	1				1
	Totals	120				120
	B.A.	1.06				1.06
Check #4	1	39				39
	2	25				25
	3	13				13
	4	2	1	1		4
	5		3		1	4
	6				1	1
	7				1	1
	Totals	79	4	1	3	87
	B.A.	1.57	.50	.09	.60	2.75
Check #5	1	55				55
	2	14				14
	3	6	1			7
	Totals	75	1			76
	B.A.	.90	.05			.95

	DBH	O	I	CD	D	Totals
Released #1	1	17				17
	2	6				6
	3	1				1
	4		2	1		3
	5					
	6			1		1
	Totals	24	2	2		28
	B.A.	.27	.18	.28		.73
Released #2	1	20				20
	2	5				5
	3		2			2
	Totals	25	2			27
	B.A.	.22	.10			.32
Released #3	1	12				12
	2	9				9
	Totals	21				21
	B.A.	.26				.26
Released #4	1	17				17
	2	5				5
	3	5				5
	4	1				1
	Totals	28				28
	B.A.	.54				.54
Released #5	1	13				13
	2	10				10
	3	1				1
	Totals	24				24
	B.A.	.34				.34

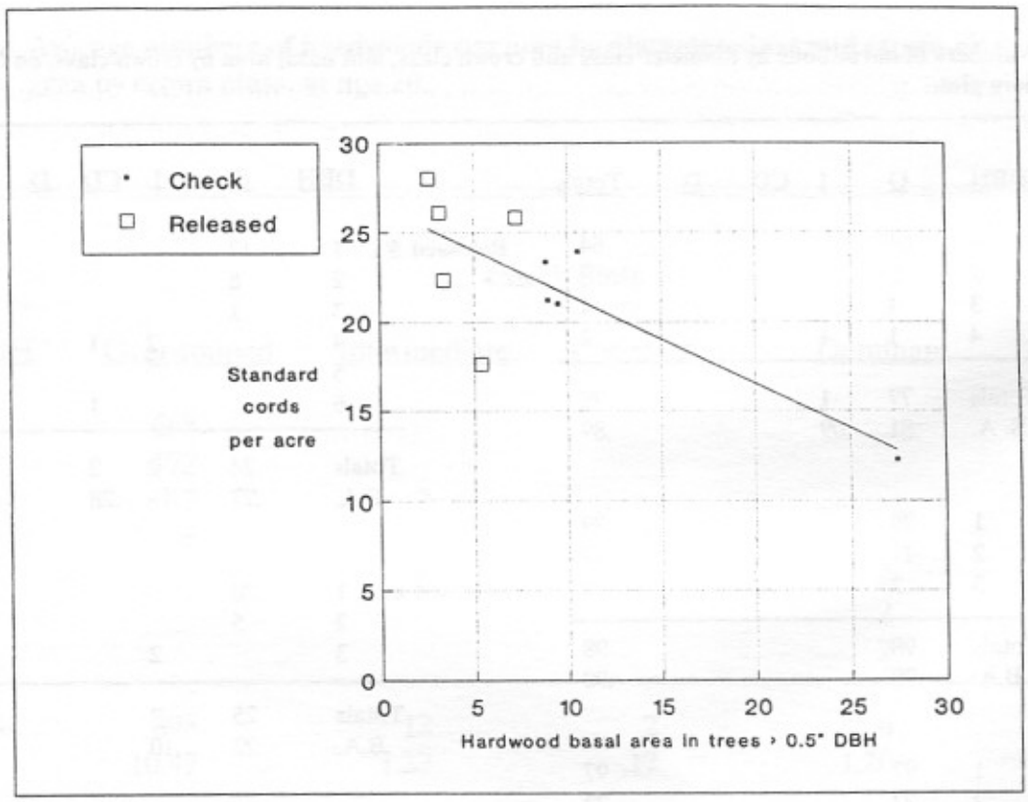

Figure 3. Pine cordwood yields at age 20 related to hardwood basal area.

Table 7. Percent of trees by free-to-grow class for each plot, at age 4.

		FTG Class				
	Plot	1	2	3	4	Means
Check	1	53	45	2		1.49
	2	37	63			1.63
	3	47	53			1.53
	4	32	56	12		1.80
	5	55	45			1.45
	Means	45	52	3		1.58
Released	1	85	15			1.15
	2	93	7			1.07
	3	96	4			1.04
	4	95	5			1.05
	5	97	3			1.03
	Means	93	7			1.07

estimated at age 4. Table 7 shows the percent of trees in each free-to-grow class for each plot, at age 4. In Figure 4, pine cordwood yields for each plot at age 20 are plotted over the average free-to-grow index at age 4. A simple linear regression fitted to these data accounted for 32 percent of the variation in cordwood yields.[4]

[4]Estimated standard cords = 34.04 - 8.9766 (free-to-grow index at age 4), $r^2 = .319$, probability of a larger F = .089.

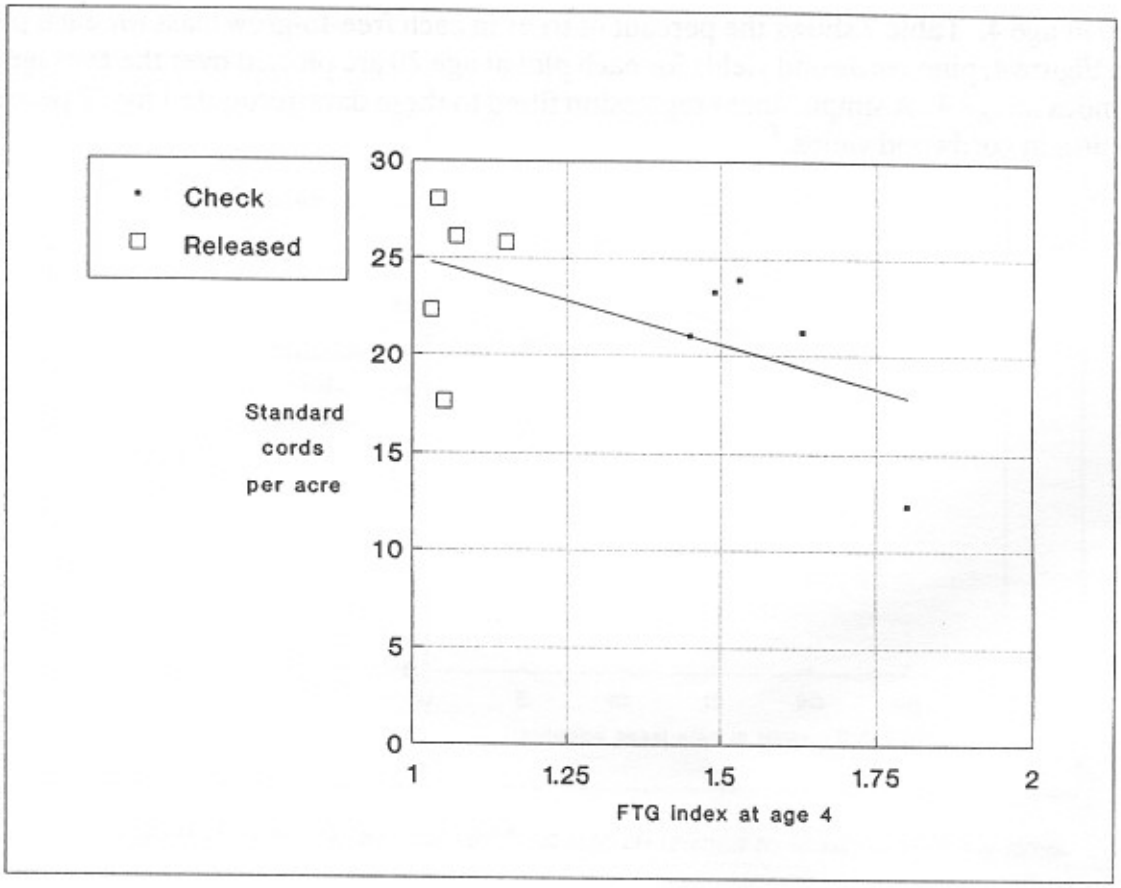

Figure 4. Pine cordwood yields at age 20 related to FTG index.